

Statistical bulletin

# UK natural capital accounts: 2023

Estimates of the financial and societal value of natural resources to people in the UK.

Contact:  
Maggie MacLellan, Hazel  
Trenbirth and Kennedy Okafor  
natural.capital.team@ons.gov.uk  
+44 1633 580051

Release date:  
27 November 2023

Next release:  
To be announced

## Correction

**19 December 2023 09:30**

We have corrected an error in the physical value of air pollution regulating under regulating services. The previous version incorrectly excluded some physical removals due to errors in the aggregation of geographic areas. Figure 6 is also affected as physical flows are used to apportion annual monetary values across habitats. Total monetary values (annual and asset) are unaffected.

# Notice

**5 July 2024**

We have found an error affecting the service of fish provisioning where data was incorrectly apportioned across the nations. This has a minor impact (less than 1%) on fish provisioning values for the UK, but has a larger impact on the values for the four nations. We will correct this error in the next UK Natural Capital Accounts, due to be published on 8th November.

# Table of contents

1. [Main points](#)
2. [Understanding natural capital accounts](#)
3. [Extent of habitats in the UK](#)
4. [Ecosystem services](#)
5. [Provisioning services](#)
6. [Regulating services](#)
7. [Cultural services](#)
8. [Asset values](#)
9. [UK natural capital accounts data](#)
10. [Glossary](#)
11. [Measuring the data](#)
12. [Strengths and limitations](#)
13. [Related links](#)
14. [Cite this statistical bulletin](#)

# 1 . Main points

- In 2021, the total asset value of ecosystem services in the UK was just over £1.5 trillion, an increase of 3% since 2017.
- In 2021, cultural services made up the majority of the asset value (61%), followed by provisioning (32%) and regulating (7%) services.
- Health benefits from recreation, valued at £445 billion in 2021, was the largest contribution to the total asset value of UK ecosystem services.
- In 2021, the total annual value of ecosystem services in the UK was £47 billion.
- Renewable electricity provisioning (physical flow) increased by 275% between 2011 and 2021, from 21,899 gigawatt hours (GWh) to 82,142 GWh.
- An estimated 1,335,686 tonnes of air pollution were removed by nature in the UK in 2021, with an annual value of around £2.5 billion.
- The total area of enclosed farmland was approximately 12 million hectares in 2021, 50% of the total UK land area, and down from 54% in 1990.

As a result of changing methods and an expanding portfolio of ecosystem services measured, this latest account cannot be compared with previous accounts on a like-for-like basis. The latest methods developed have been applied across all years in the latest accounts, giving a consistent time series.

## 2 . Understanding natural capital accounts

Natural wealth is reflected in aspects like the productivity of soils and access to clean water and recreational green space. Any natural resource or process that supports human life, society, and the economy is an important part of our natural capital. Natural capital accounting estimates the current value of natural wealth and what it could provide for current and future generations. This is an important aspect of a wider move to better understand inclusive wealth, as defined in our [New Beyond GDP measures for the UK article](#), and as described in [The Economics of Biodiversity: The Dasgupta Review, published on GOV.UK](#).

The total natural capital monetary estimates should be interpreted as a partial or minimum value of the services provided by the natural environment, as a number of services, such as flood protection from natural resources, are not currently included. We are working to include as much of the economic value of the natural world as possible, which is challenging given its scale and complexity. In addition to economic value, as part of the [United Nations System of Environmental-Economic Accounting – Ecosystem Accounting \(SEEA EA\) \(PDF, 5.33MB\)](#), we are continuing to develop methods for tracking changes in the ecosystem's extent and condition, as described in our [Habitat extent and condition bulletin](#).

You can view and download the complete list of data sources used in this publication on our [All data related to UK natural capital accounts: 2023 webpage](#).

### 3 . Extent of habitats in the UK

The most common form of landcover across the UK is enclosed farmland, which is 12 million hectares and 50% of UK land area in 2021 (Figure 1), a decrease from 54% in 1990. The extent of enclosed farmland decreased 8% from 13,428,388 to 12,296,678 hectares between 1990 and 2021 with 4% of former enclosed farmland becoming an urban habitat (consisting of built structures and other infrastructure).

The same period also saw a 24% decrease in mountains, moorland and heath habitat from 3,338,540 to 2,524,650 hectares with 446,575 hectares becoming semi-natural grassland. In their 2016 journal article [Climate, pollution and grazing drive long-term change in moorland habitats](#), Britton and others found a continued decreasing extent of UK moorland since the 1940s.

To get a measure of extent and change for all the seven terrestrial habitats nationally, the [UK Centre for Ecology and Hydrology \(UKCEH\) Land Cover Maps](#) (LCM) are used. Note that different data sources for mapping are used for [woodland](#) and [urban](#) natural capital accounts.

#### Figure 1: Enclosed farmland in the UK decreased by 8% between 1990 and 2021

##### Notes

1. Raster data were used from UK Centre for Ecology and Hydrology - Great Britain land cover maps for 1990 and 2021.
2. Digital Object Identifier (DOI) for LCM1990 Raster data for Great Britain. Rowland, C. S., Marston, C. G., Morton, R. D., and O'Neil, A. W. (2020). Land Cover Map 1990 (25 metre raster, Great Britain) v2 [Dataset]. NERC Environmental Information Data Centre.
3. Digital Object Identifier (DOI) for LCM2021 Raster data for Great Britain. Morton, R. D., Marston, C. G., O'Neil, A. W., and Rowland, C. S. (2022). Land Cover Map 2021 (25 metre rasterised land parcels, Great Britain) [Dataset]. NERC Environmental Information Data Centre.
4. The totals in the chart for each habitat do not equal habitat totals in the text as there is a category 'out of map' where the land cover mapping was unable to identify what habitat was in an area for either 1990 or 2021.

### 4 . Ecosystem services

Ecosystem services estimate the contribution of natural assets to the economy and society. We estimate these both in physical volume and monetary value. This includes provisioning services such as food and water, regulating services such as pollution removal, and cultural services such as recreation.

In 2021, the latest year with complete data, the total annual value for the ecosystem services we are currently able to measure was £47 billion (2022 prices).

#### Figure 2: Health benefits of recreation were estimated to be £7 billion for the UK in 2021

The annual value for ecosystem services in the UK, £ million (2022 prices), 1998 to 2022

##### Notes

1. Data for agricultural biomass provisioning, coal provisioning, fish provisioning, minerals and metals provisioning, oil and gas provisioning, renewable electricity provisioning, water provisioning, greenhouse gas regulating, and recreation and aesthetic (house prices) are only available up to 2021.

In 2021, the total annual values currently measured for ecosystem services in England, Scotland, Wales, and Northern Ireland, were around £30 billion, £14 billion, £2 billion, and £1 billion, respectively.

### **Figure 3: Recreation and Tourism was the service with the highest annual value for both England and Wales in 2021**

**The annual value of ecosystem services in England, Scotland, Wales and Northern Ireland, £ million (2022 prices), 1998 to 2022**

#### **Notes**

1. Comparable data are not available for Northern Ireland for urban heat regulating.
2. Data for agricultural biomass provisioning, coal provisioning, fish provisioning, minerals and metals provisioning, oil and gas provisioning, renewable electricity provisioning, water provisioning, greenhouse gas regulating, and recreation and aesthetic (house prices) are only available up to 2021.

## 5 . Provisioning services

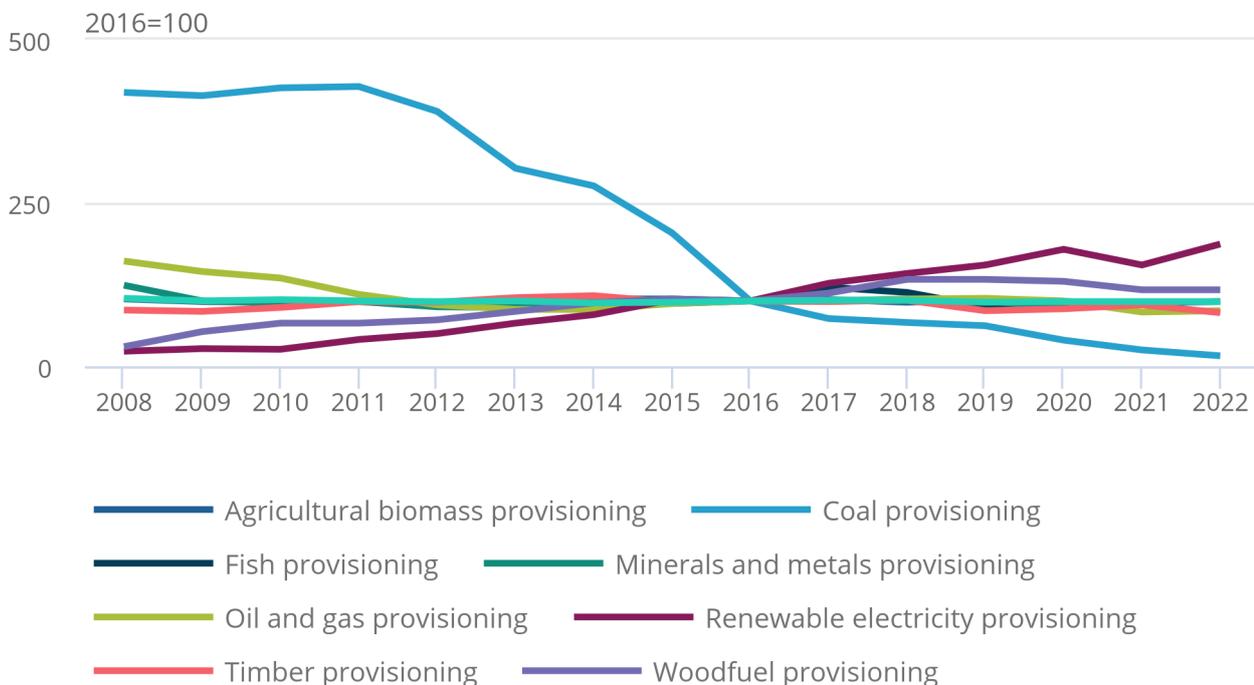
Provisioning services refer to tangible goods that people can harvest, extract or derive from the environment, such as food, water, energy and materials. These capture the values of nature’s contribution and exclude any form of industry processing. We have included agricultural biomass, oil, gas, coal, timber, woodfuel, mineral and metal extractions, fish, water and renewable electricity provision.

**Figure 4: Renewable electricity provisioning demonstrated the greatest relative increase in physical production between 2016 and 2022**

Physical index values of each provisioning service, Index 2016=100, UK, 2008 to 2022

Figure 4: Renewable electricity provisioning demonstrated the greatest relative increase in physical production between 2016 and 2022

Physical index values of each provisioning service, Index 2016=100, UK, 2008 to 2022



Source: UK natural capital accounts from the Office for National Statistics

Notes:

1. Data for fish provisioning are only available from 2016 to 2021.

From 2011 to 2021, there was a decline of 25% in the quantity of oil and gas provisioning. The same period saw an increase of 275% in renewable electricity provisioning, from 21,899 gigawatt hours (GWh) in 2011 to 82,142 GWh in 2021.

All renewable services decreased in generation in 2021, a result of weather conditions such as reduced wind speeds, sun hours and rainfall. However, generation increased again by 21% in 2022 to 99,192 GWh.

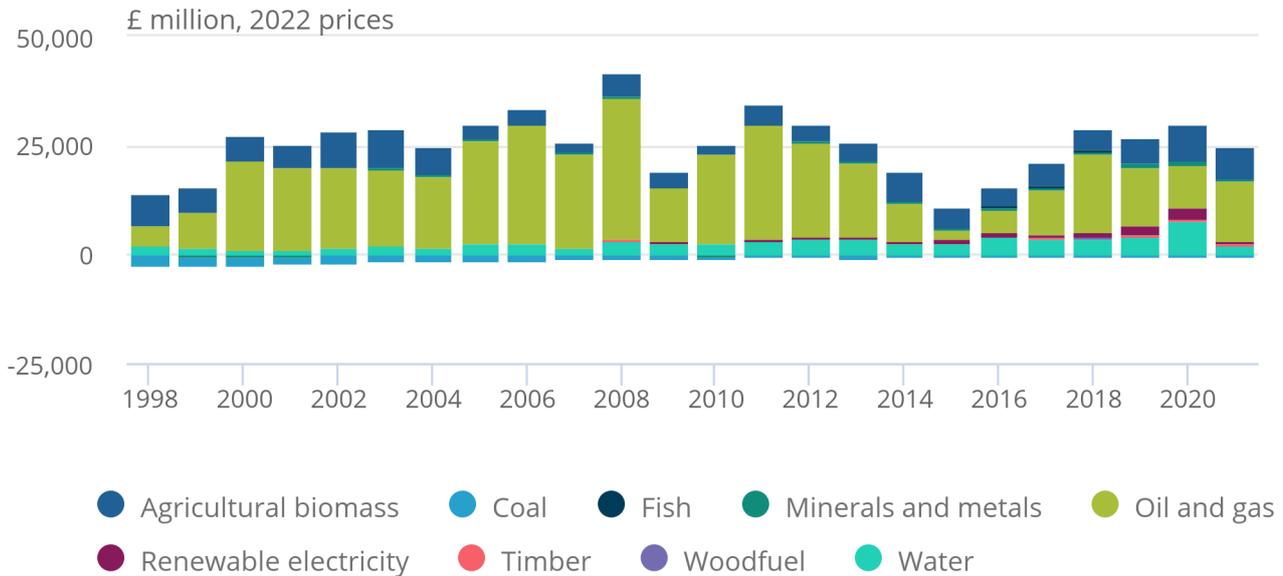
In 2021, oil and gas accounted for 56% of the total annual value of the provisioning services (Figure 5).

**Figure 5: The annual value of renewable electricity provisioning increased by 184% between 2011 and 2021**

Provisioning services annual value, £ million (2022 prices), UK, 1998 to 2021

**Figure 5: The annual value of renewable electricity provisioning increased by 184% between 2011 and 2021**

Provisioning services annual value, £ million (2022 prices), UK, 1998 to 2021



Source: UK natural capital accounts from the Office for National Statistics

Notes:

1. Annual valuations for renewables are only available between 2009 and 2021.
2. Data for fish provisioning are only available from 2016 to 2021.

The negative annual values throughout the timeseries for coal, mineral and metal provisioning services are a result of low industry profit levels, which after deducting the user cost of capital as part of the resource rent calculation produces a negative natural capital annual value. See more information on resource rent in [Section 11. Measuring the data](#) and in our [UK natural capital accounts methodology: 2023](#).

## 6 . Regulating services

Regulating services help to maintain the quality of the environment we rely upon. They include natural processes such as air quality, urban heat, greenhouse gas and noise regulating services. Flood regulating services are not currently included.

Table 1: UK regulating services included in UK natural capital accounts and their annual and asset values, 2021

| <b>Ecosystem service</b>         | <b>Annual value (flow)<br/>£ million (2022 prices)</b> | <b>Asset value (stock)<br/>£ million (2022 prices)</b> |
|----------------------------------|--|--|
| <b>Air pollution regulating</b>  | 2,469  | 124,511  |
| <b>Greenhouse gas regulating</b> | -280   | -35,935  |
| <b>Noise regulating</b>          | 17   | 944  |
| <b>Urban heat regulating</b>     | 220  | 18,048   |

Source: Office for National Statistics

Vegetation can remove airborne pollutants from the environment, therefore reducing harmful impacts on human health. Air pollutants that are measured in these accounts include NH<sub>3</sub>, NO<sub>2</sub>, O<sub>3</sub>, particulate matter 10 (PM<sub>10</sub>) (with PM<sub>2.5</sub> as a subset) and SO<sub>2</sub>.

The service of air pollution regulation accounted for the majority of the annual value of regulating services in 2021, with nature removing an estimated 1,335,686 tonnes of pollutants from the air. While PM<sub>2.5</sub> was only 2% of the total volume of pollutants removed in the UK between 2007 and 2022, the removal of PM<sub>2.5</sub> accounted for most of the annual value of air pollution removal (86%) between 2007 and 2022. This is because PM<sub>2.5</sub> causes the most [serious health impacts \(as explained in our UK air pollution removal article\)](#). Therefore, removing this pollutant produces the highest monetary health value. A full breakdown of value by pollutant type by local authority area can be found in our [UK natural capital accounts dataset](#).

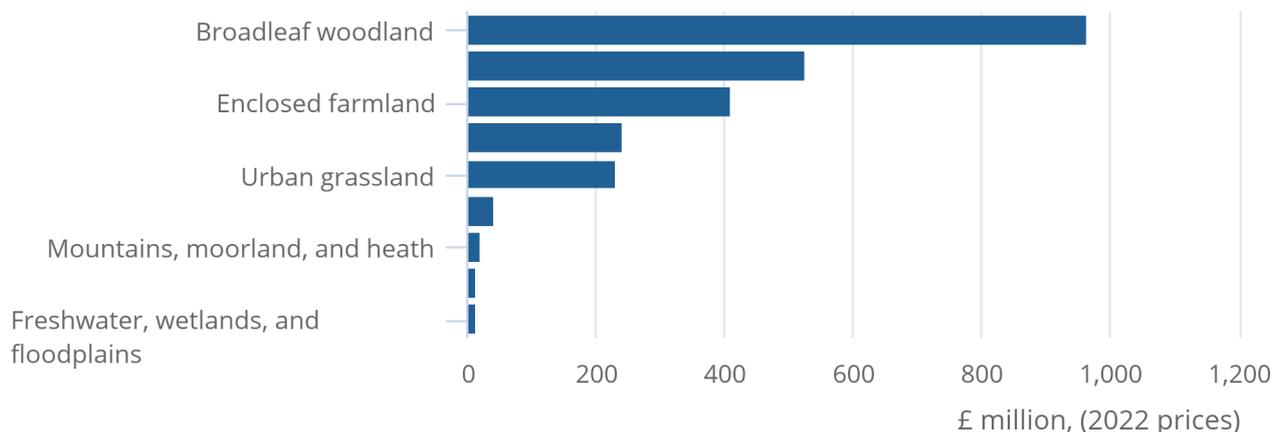
Broadleaved woodland habitats' removal of pollution contributed the highest percentage of the UK annual value in 2021 (39%) (Figure 6). This is a result of trees removing more PM<sub>2.5</sub> than other habitats.

**Figure 6: Broadleaved woodland habitats provided the highest value of pollution removal services – an estimated £965 million in 2021**

Air pollution removal annual value by habitat £ million (2022 prices), UK, 2021

Figure 6: Broadleaved woodland habitats provided the highest value of pollution removal services – an estimated £965 million in 2021

Air pollution removal annual value by habitat £ million (2022 prices), UK, 2021



Source: Office for National Statistics, UK Centre for Ecology and Hydrology, and Department for Environment, Food and Rural Affairs

Notes:

1. Pollutants considered include ozone (O<sub>3</sub>), nitrogen dioxide (NO<sub>2</sub>), ammonia (NH<sub>3</sub>), particulate matter 10 and 2.5 (PM<sub>10</sub> and PM<sub>2.5</sub>), and sulphur dioxide (SO<sub>2</sub>).

The net annual value of greenhouse gas regulating services was estimated to be negative £280 million in 2021 (Table 1). This is largely because the UK is estimated to emit more greenhouse gases than it removes from land use, land use change and forestry (LULUCF), as explained in the [National Atmospheric Emission Inventory 2019 report \(PDF, 4.36MB\)](#).

There are many ways in which greenhouse gases move between the atmosphere and the land, including by being released or removed directly by a habitat as it functions, or when a habitat is changed from one habitat to another. In the UK, degraded [peatlands \(as described in our UK natural capital: peatlands bulletin\)](#) emit more greenhouse gases than they remove.

## 7 . Cultural services

Cultural services are the non-material benefits we obtain from ecosystems through recreation, tourism, and their associated health benefits.

While annual expenditure on recreation and tourism fell by 32% between 2011 (£15.6 billion) and 2022 (£10.6 billion), the annual value of health benefits from recreation increased by 15% between 2011 and 2022 (Figure 2). People spent less money to visit nature during this period but visits to nature increased. In 2020, while people spent less money visiting nature, the number of visits to local nature increased.

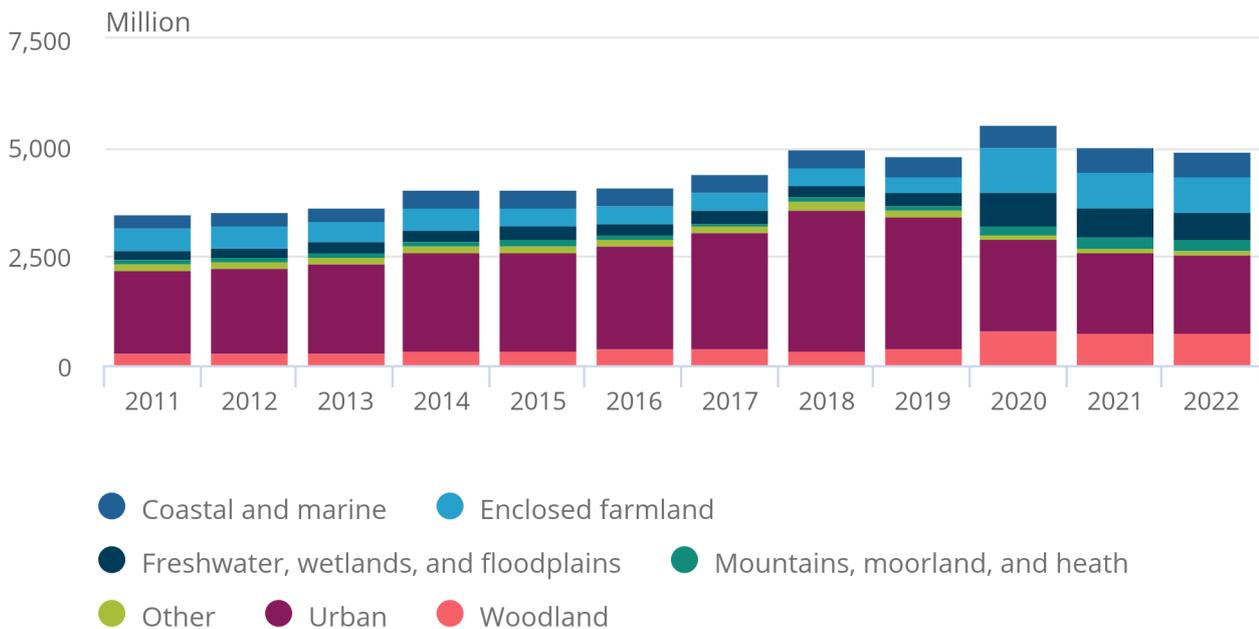
You can read more about recent trends in the amount of time spent in nature and the value of health benefits from doing so in our article [A million fewer people are gaining health benefits from nature since 2020](#).

**Figure 7: The natural environment in urban areas is consistently the most popular UK habitat to visit, though visits fell by 39% between 2019 and 2022**

Number of outdoor recreation and tourism visits to UK habitats, millions, 2011 to 2022

Figure 7: The natural environment in urban areas is consistently the most popular UK habitat to visit, though visits fell by 39% between 2019 and 2022

Number of outdoor recreation and tourism visits to UK habitats, millions, 2011 to 2022



**Source: Monitor of Engagement with the Natural Environment Survey (MENE), People and Nature Survey (PaNS), The Welsh Outdoor Recreation Survey, Scottish Recreation Survey, Scotland's People and Nature Survey**

There were an estimated 4.9 billion recreation and tourism visits to nature in the UK in 2022 (Figure 7). While recreation and tourism expenditure decreased by 74% between 2019 and 2020, when coronavirus (COVID-19) pandemic restrictions were implemented, the number of visits to nature peaked in 2020 (5.5 billion).

A further aspect of cultural services is captured within the value of house prices. This is composed of both:

- the value of recreation associated with proximity to green (land) and blue (water) spaces, enabling people to make "free trips" to the natural environment
- the aesthetic value provided by a view of green or blue spaces, also known as visual amenity services

This combined aesthetic and recreation value was estimated to be worth £4 billion in 2021.

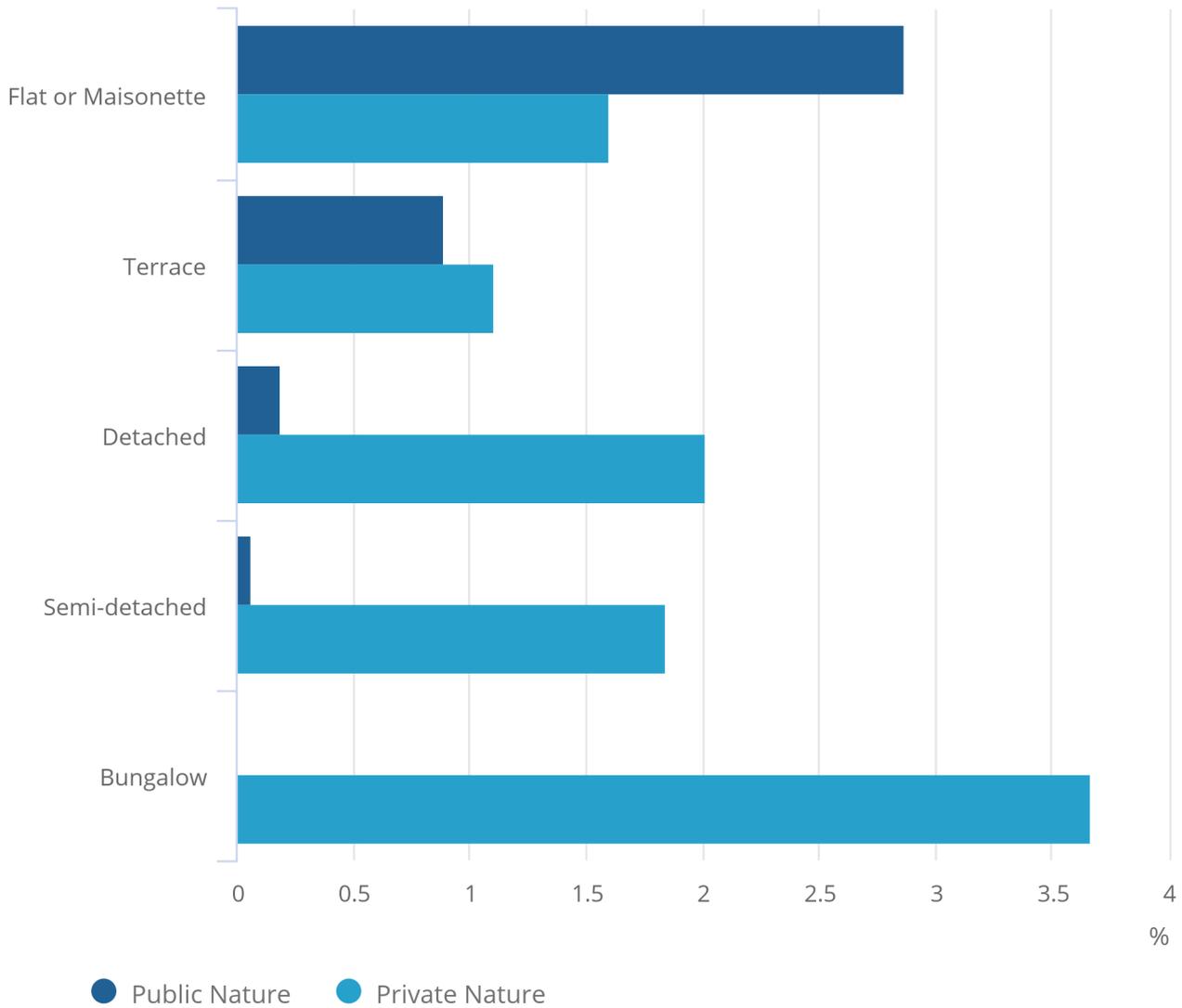
In 2021, publicly accessible green space (for example, public parks), added greatest value (3%) to flats or maisonettes compared with other property types, whereas private nature (for example, private gardens) added the greatest value (4%) to bungalows.

**Figure 8: Public nature added the highest percentage (3%) of added value to flats or maisonettes**

The percentage of value added to house price from public and private nature for different property types, UK, 2021

**Figure 8: Public nature added the highest percentage (3%) of added value to flats or maisonettes**

The percentage of value added to house price from public and private nature for different property types, UK, 2021



Source: Office for National Statistics

## 8 . Asset values

Natural capital asset values measure the stream of services (stock) of that natural resource in terms of future expected supply and use over a reasonably predictable time horizon. This contrasts with annual valuations within a particular year (flows).

The UK asset value of ecosystem services we can currently value was estimated to be just over £1.5 trillion in 2021 (Table 2).

Table 2: Asset Value for all UK ecosystem services, £ million (2022 prices), 2021

| <b>Ecosystem Service</b>                       | <b>England</b> | <b>Scotland</b> | <b>Wales</b> | <b>Northern Ireland</b> | <b>UK</b> |
|--|----------------|-----------------|--------------|-------------------------|-----------|
| <b>Agricultural biomass provisioning</b>       | 140,100        | 19,648          | 10,025       | 13,961                  | 183,735   |
| <b>Coal provisioning</b>                       | -775           | -840            | -2,088       | 0                       | -3,703    |
| <b>Fish provisioning</b>                       | 617            | 2,178           | 46           | 118                     | 2,969     |
| <b>Minerals and metals provisioning</b>        | 9,962          | 1,094           | 737          | 796                     | 12,589    |
| <b>Oil and gas provisioning</b>                | 14,945         | 97,030          | 0            | 0                       | 111,975   |
| <b>Renewable electricity provisioning</b>      | 21,972         | 13,789          | 1,516        | 3,458                   | 40,736    |
| <b>Timber provisioning</b>                     | 2,512          | 7,815           | 1,202        | 446                     | 11,767    |
| <b>Woodfuel provisioning</b>                   | 1,276          | 1,503           | 255          | 86                      | 2,988     |
| <b>Water provisioning</b>                      | 98,783         | 17,283          | 7,017        | 7,708                   | 130,792   |
| <b>Air pollution regulating</b>                | 113,806        | 4,674           | 5,177        | 853                     | 124,511   |
| <b>Greenhouse gas regulating</b>               | -6,993         | -15,946         | 11,001       | -23,998                 | -35,935   |
| <b>Noise regulating</b>                        | 807            | 38              | 68           | 32                      | 944       |
| <b>Urban heat regulating</b>                   | 17,392         | 168             | 488          | [x]                     | 18,048    |
| <b>Recreation (health benefits)</b>            | 369,791        | 39,526          | 22,665       | 12,825                  | 444,808   |
| <b>Aesthetic and recreation (house prices)</b> | 102,414        | 8,561           | 4,844        | 2,162                   | 118,342   |
| <b>Tourism and recreation (expenditure)</b>    | 291,141        | 28,347          | 29,245       | 13,931                  | 380,606   |
| <b>All services</b>                            | 1,177,752      | 224,869         | 92,198       | 32,378                  | 1,545,172 |

Source: Office for National Statistics – UK natural capital accounts

### Notes

1. [x] indicates that data are not available.
2. Country-level data may not add up to the UK total because of rounding and other data limitations.

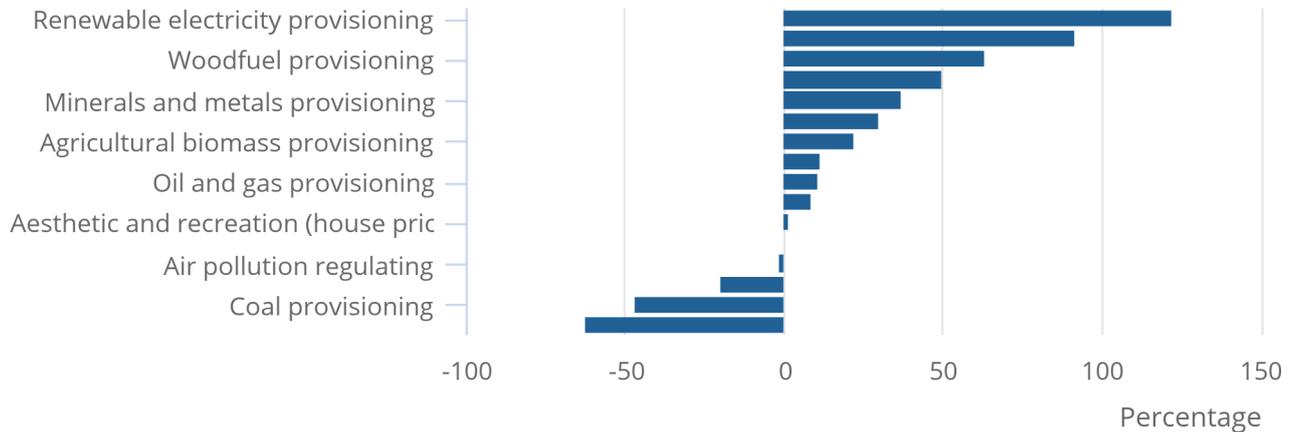
Renewable electricity provisioning had the largest increase in asset value between 2017 and 2021 (122%), whereas in the same period, fish provisioning decreased by 63%. A change in the sustainability status of mackerel from sustainable to unsustainable in 2020, as reported on the [Joint Nature Conservation Committee website](#), contributed to a reduction in the asset value of fish.

## Figure 9: Fish provisioning decreased in asset value by 63% between 2017 and 2021

Percentage change in asset value in the UK between 2017 and 2021

### Figure 9: Fish provisioning decreased in asset value by 63% between 2017 and 2021

Percentage change in asset value in the UK between 2017 and 2021



Source: UK natural capital accounts from the Office for National Statistics

## 9 . UK natural capital accounts data

### [UK natural capital accounts](#)

Dataset | Released 27 November 2023

Estimates of the financial and societal value of natural resources to people in the UK.

### [UK natural capital accounts – detailed summary](#)

Dataset | Released 27 November 2023

Detailed data breakdowns of the financial and societal value of natural resources to people in the UK.

## 10 . Glossary

### Asset

A natural asset is a resource that can generate goods or services to humans into the future.

Asset valuation estimates the stream of services that are expected to be produced by the natural resource over a reasonably predictable time horizon.

## Ecosystem services

Ecosystem services estimate the contribution of natural assets in the UK to the economy and society.

This includes provisioning services such as food and water, regulating services such as flood protection and pollution removal, and cultural services such as recreation.

## Physical flow

The physical flow of a natural asset is the measure of its output in units appropriate to the goods or services.

This differs from the annual value and asset value, which measure the monetary value of a natural resource.

## 11 . Measuring the data

More detailed quality and methodology information on strengths, limitations, appropriate uses, and how the data were created is available in our accompanying [UK natural capital accounts methodology guide: 2023](#).

A wide variety of sources are compiled to create estimates of natural capital in the UK.

These accounts have been compiled in line with the guidelines in the [United Nations \(UN\) System of Environmental-Economic Accounting \(SEEA\) Central Framework](#) and [the UN SEEA Ecosystem Accounting](#). These, in turn, relate to the wider framework of the system of national accounts. We have also published the principles we follow when interpreting UN guidance to produce the natural capital accounts in our [Principles of UK natural capital accounting methodology](#).

## 12 . Strengths and limitations

These experimental accounts are being continually revised to produce the best statistics with the available data and methods.

We have identified limitations of the data as well as priorities for future development. More detailed quality and methodology information on strengths, limitations, appropriate uses, and how the data were created is available in our updated accompanying [UK natural capital accounts methodology guide: 2023](#).

## 13 . Related links

### [A million fewer people are gaining health benefits from nature since 2020](#)

Digital article | Released 24 November 2023

People in the UK are spending less time in natural environments since the coronavirus (COVID-19) pandemic.

### [Urban natural capital accounts, UK: 2023](#)

Bulletin | Released 7 September 2023

Additional information splitting down UK data in the Urban natural capital accounts, UK: 2023 publication for England, Scotland, Wales and Northern Ireland. Extra data on urban condition indicators, summary ecosystem services, and asset value.

### [Scotland natural capital accounts: 2023](#)

Bulletin | Released 15 June 2023

Estimates of the financial and societal value of natural resources to people in Scotland.

### [England natural capital accounts: 2023](#)

Bulletin | Released 25 January 2023

Estimates of the financial and societal value of natural resources to people in England.

### [Health benefits from recreation, natural capital, UK: 2022](#)

Bulletin | Released 27 May 2022

Further development of the UK recreation natural capital ecosystem service accounts, including specific methods used to estimate the health benefits gained from nature-based recreational activities.

### [Habitat extent and condition, natural capital, UK: 2022](#)

Bulletin | Released 3 May 2022

The size of area and condition indicators for eight natural UK habitats, including woodland, enclosed farmland, semi-natural grasslands, and coastal margins. Uses the System of Environmental-Economic Accounting framework for Ecosystem Accounting. Experimental estimates.

## 14 . Cite this statistical bulletin

Office for National Statistics (ONS), released 27 November 2023, ONS website, bulletin, [UK natural capital accounts: 2023](#)